## What is claimed is:

- 1. A pressure sensing device comprising:
  2 a substrate having a fluorescent region;
- a shell having an outer surface and an inner
- 4 surface;

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- a beam affixed to the inner surface of the shell by two posts;
  - a first light transporter having a distal end and an end proximate the outer surface of the shell in an area adjacent the beam and the fluorescent region; and
  - a second light transporter having a distal end and an end proximate the outer surface of the shell in an area adjacent the beam and the fluorescent region.
  - 1 2. The device of claim 1, further comprising a
  - 2 sensor circuit in communication with the distal end of the
  - 3 second light transporter.
  - 1 3. The device of claim 1, wherein the substrate
  - 2 includes a photodiode illuminated by light from the first
  - 3 light transporter to excite the beam into vibration.
  - 1 4. The device of claim 1, wherein the shell and
  - 2 the beam are at least partially light transmissive so that
  - 3 light from the first light transporter reaches the photodiode.

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1 5.\_\_\_The device of claim 1, wherein the fluorescent

- 2 region is responsive to a first light wave of a first
- 3 wavelength from the first light transporter to generate a
- 4 second light wave having a second wavelength, and wherein the
- 5 second light wave is transmitted by the second light
- 6 transporter.

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- includes a photodiode illuminated by a first light wave of a first wavelength from the first light transporter to excite the beam into vibration, wherein the fluorescent region is responsive to the first light wave to generate a second light wave having a second wavelength, and wherein the second light wave has a property dependent upon a frequency of vibration of the beam and is transmitted by the second light transporter.
- 7. The device of claim 1, wherein the fluorescent region comprises erbium.
- 1 8. The device of claim 7, wherein the fluorescent 2 region is illuminated by a light signal from the first light 3 transporter having a wavelength of 900 nm.
- 1 9. The device of claim 1, wherein the shell
- 2 defines an evacuated cavity enclosing the beam and the

3 fluorescent region.

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- 1 10. The device of claim 1, wherein the beam is
- 2 excited to resonance based upon a photodiode.
- 1 11. The device of claim 1, wherein the substrate
- 2 supports the shell and the beam.
  - 12. The device of claim 1, wherein the shell, the beam and the substrate are micromachined.
  - 13. The device of claim 1, wherein the device is used to sense pressure within an organism.
- 1 14. The device of claim 1, wherein the first and
- 2 second light transporters are optical fibers.
- 1 15. The device of claim 1, wherein the first and
- 2 second light transporters are optical waveguides.
- 1 16. A method for sensing pressure using a vacuum
- 2 cavity device having at least one fluorescent region and a
- 3 pressure sensitive resonant beam, the method comprising:
- 4 directing a first light wave toward the
- 5 pressure sensitive resonant beam and the fluorescent region;
- 6 exciting the pressure sensitive resonant beam to a

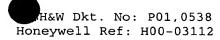
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- 7 resonant frequency in response to the first light wave; and
- 8 transmitting away from the pressure sensitive
- 9 resonant beam a second light wave generated by the fluorescent
- 10 region in response to the first light wave, the first and
- 11 second light waves having different wavelengths, the second
- 12 light wave having a property corresponding to the resonant
- 13 frequency of the pressure sensitive resonant beam.

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- 17. The method of claim 16, further comprising evaluating the second light wave in a sensor circuit.
- 18. The method of claim 16, wherein the exciting of the pressure sensitive resonant beam comprises directing the first light wave to a photodiode mounted proximate to the pressure sensitive resonant beam.
- 1 19. The method of claim 16, wherein the
- 2 fluorescent region comprises erbium.
- 1 20. The method of claim 16, wherein the first
- 2 light wave has a wavelength of 900 nm.
- 1 21. The method of claim 16, wherein the shell, the
- 2 pressure sensitive resonant beam and the substrate are
- 3 micromachined.



- 1 22. The method of claim 21, further comprising
- 2 measuring pressure in a region of the human body as a function
- 3 of the second light wave.

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- 1 23. An optically powered integrated microstructure
- 2 remote pressure sensor comprising:
  - a substrate supporting a polysilicon shell having an outer surface and an inner surface, the inner surface defining an evacuated cavity enclosing an area of the substrate, the substrate being provided with a fluorescent region;
  - a microbeam affixed to the inner surface of the shell within the evacuated cavity by two spaced apart posts, the microbeam disposed in the vicinity of the substrate;
- a photodiode integrated into the substrate at a surface location beneath the microbeam:
- 12 a first light transporter having a distal end and a
- 13 proximate end, the proximate end of the first optical fiber
- 14 being disposed adjacent the outer surface of the shell to
- 15 direct light from the first optical fiber to the photodiode
- 16 and to the fluorescent region; and
- a second light transporter having a distal end and a
- 18 proximate end, the proximate end of the second light
- 19 transporter being disposed at the outer surface of the shell
- 20 so as to transmit light emitted by the fluorescent region,
- 21 wherein the transmitted light indicates a frequency of
- 22 vibration of the beam.

- 1 The sensor of claim 23, further comprising
- 2 sensor electronics receiving, through the distal end of the
- 3 second light transporter, the light wave generated by the
- 4 fluorescent region.
- 1 25. The sensor of claim 23, wherein the light - i []2 received by fluorescent region from the first light [] A ... The state of transporter has a wavelength of 900 nm.
  - 26. The sensor of claim 23, wherein the microbeam is excited to resonance by the photodiode.
  - 27. The sensor of claim 23, wherein excitation of
  - 2 the microbeam comprises directing the first light wave onto
  - 3 the photodiode.
  - 1 28. The sensor of claim 23, wherein the shell, the
  - 2 microbeam and the substrate are micromachined.
  - 1 29. The sensor of claim 23, wherein the sensor
  - 2 measures pressure within the human body.
  - 1 30. The sensor of claim 23, wherein the first and
  - 2 second light transporters are optical fibers.

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- 1 31. The sensor of claim 23, wherein the first and
- 2 second light transporters are optical waveguides.
- 1 32. A pressure sensing device comprising:
- a substrate having a photodiode and a fluorescent
- 3 region;

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- a shell having an outer surface and an inner surface;
  - a beam affixed to the inner surface of the shell by two posts; and
  - a light transporter having a distal end and an end proximate the outer surface of the shell in an area adjacent the beam and the fluorescent region.
- 1 33. The device of claim 32, wherein the
- 2 fluorescent region comprises erbium.
- 1 34. The device of claim 33, wherein the
- 2 fluorescent region is illuminated by a light signal having a
- 3 wavelength of 900 nm.
- 1 35. The device of claim 32, wherein the shell
- 2 defines an evacuated cavity enclosing the beam and the
- 3 fluorescent region.
- 1 36. The device of claim 32, wherein the beam is

- 2 excited to resonance based upon the photodiode.
- 1 37. The device of claim 32, wherein the shell, the
- 2 microbeam and the substrate are micromachined.
- 1 38. The device of claim 32, wherein the device is 2 used to sense pressure within an organism.
  - 39. The device of claim 32, wherein the shell and the beam are at least partially light transmissive so that light from the light transporter reaches the photodiode.
  - 40. The device of claim 32, wherein the light transporter is an optical fiber.
- 1 41. The device of claim 32, wherein the light
- 2 transporter is an optical waveguide.
- 1 42. A pressure sensing device comprising:
- 2 a substrate having a photodiode and a fluorescent
- 3 region;

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- a shell having an outer surface and an inner
- 5 surface; and
- a beam affixed to the inner surface of the shell by
- 7 two posts.

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- 1 43. The device of claim 42, wherein the photodiode
- 2 is illuminated by a light to excite the beam into vibration.
- 1 44. The device of claim 42, wherein the shell and
- 2 the beam are at least partially light transmissive so the
- 3 light reaches the photodiode.

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- 45. The device of claim 42, wherein the fluorescent region is responsive to a light of a first wavelength to generate a second light having a second wavelength, and wherein the second light has a property dependent upon a frequency of vibration of the beam.
- The device of claim 42, wherein the 2 fluorescent region comprises erbium.
  - 1 47. The device of claim 42, wherein the
  - 2 fluorescent region is illuminated by a light having a
  - 3 wavelength of 900 nm.
  - 1 48. The device of claim 42, wherein the shell
  - 2 defines an evacuated cavity enclosing the beam and the
  - 3 fluorescent region, and wherein the substrate supports the
  - 4 shell and the beam.
  - 1 49. The device of claim 42, wherein the shell, the

- 2 beam and the substrate are micromachined.
- 1 50. The device of claim 42, wherein the device is
- 2 used to sense pressure within an organism.
- 1 51. An optically powered integrated microstructure
- 2 remote pressure sensor comprising:

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a substrate supporting a polysilicon shell having an outer surface and an inner surface, the inner surface defining an evacuated cavity enclosing an area of the substrate, the substrate being provided with a fluorescent region;

a microbeam affixed to the inner surface of the shell within the evacuated cavity by two spaced apart posts, the microbeam disposed in the vicinity of the substrate;

a photodiode integrated into the substrate at a surface location beneath the microbeam; and

a light transporter having a distal end and a proximate end, the proximate end being disposed adjacent the outer surface of the shell to direct light to the photodiode and to the fluorescent region, and to receive a light wave emitted by the fluorescent region, wherein the transmitted light indicates a frequency of vibration of the beam.

- 1 52. The sensor of claim 51, further comprising
- 2 sensor electronics receiving, through the distal end of the
- 3 light transporter, the light wave emitted by the fluorescent

- 4 region.
- The sensor of claim 51, wherein the light 53. 1
- directed to the fluorescent region from the light transporter 2
- has a wavelength of 900 nm. 3
- The sensor of claim 51, wherein the microbeam 54. 1
- is driven to resonance by the photodiode. i a 2 Handard Maria
  - The sensor of claim 51, wherein excitation of 1 55.
- THE WASHINGTON the microbeam comprises directing the light onto the 2
- 3 mark there that N photodiode.

- The sensor of claim 51, wherein the shell, the [] 1
  - microbeam and the substrate are micromachined. 2
  - The sensor of claim 51, wherein the sensor 1 57.
  - measures pressure within the human body. 2
  - The sensor of claim 51, wherein the light 58. 1
  - transporter is an optical fiber. 2
  - The sensor of claim 51, wherein the light 59. 1
  - transporter is an optical waveguide. 2